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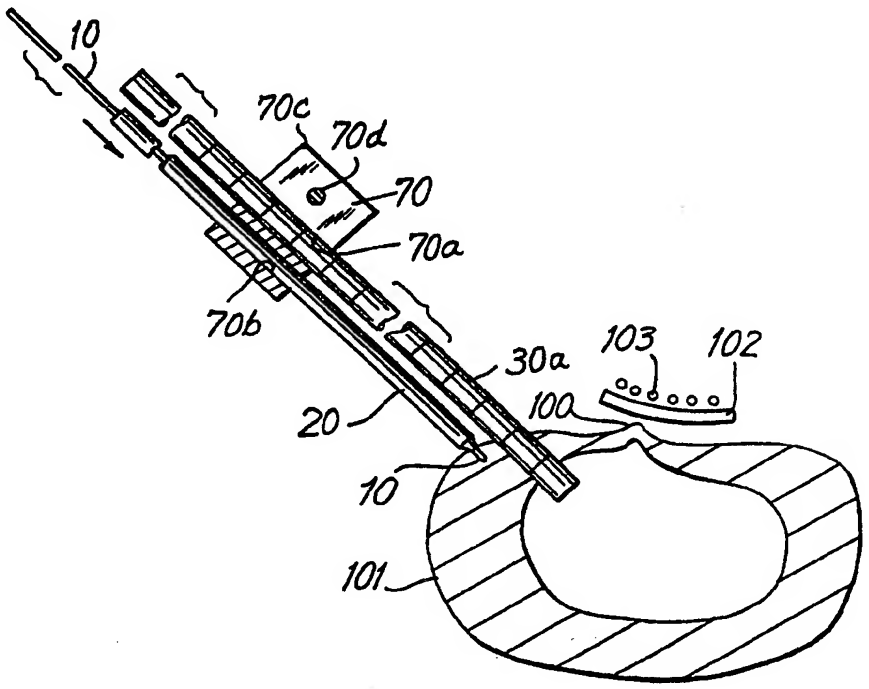
(54) Title: APPARATUS FOR TREATING HERNIATED DISCS

(57) Abstract

A method and apparatus for performing a percutaneous surgical disc procedure which includes the steps of percutaneously entering the back of the patient in a posterolateral direction with an access cannula (30a), advancing the access cannula through a first percutaneously created fenestration of the annulus of the disc (101) and securing a guide means (50) relative to the access cannula. The back of the patient is again entered percutaneously in a posterolateral direction with an accessory cannula (30b) and the accessory cannula is advanced relative to the guide means to guide the accessory cannula into a second percutaneously created fenestration of the annulus adjacent to and on the same side of the disc as the first fenestration for orientating the access cannula and the accessory cannula relative to each other on the same side of the disc.



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APPLICATION FOR PATENT

TITLE: APPARATUS FOR TREATING HERNIATED DISCS

SPECIFICATION

Field of the Invention

This application is a continuation-in-part application of U.S. Serial No. 07/784,693 which was filed October 10, 1991.

This invention relates to surgery and specifically to a novel method and apparatus for accessing herniated intervertebral discs in a human patient.

Background of the Invention

Low back pain syndrome with sciatica secondary to herniated intervertebral discs represents a major health problem in the United States. An intervertebral disc is a structure which occupies the space between the vertebrae and acts, among other things, as a shock absorbing cushion. A normal disc consists of two parts; a central part known as the "nucleus" and a surrounding part known as the "annulus" or "annulus fibrosis". The annulus degenerates with age, as does the nucleus. Degeneration of the disc is characterized by collagenation, in which some of the fluid content of the nucleus is lost and fragments of collagenized fibrous tissue are formed which float in the tissue fluid. At

this stage of degeneration, external forces can readily increase the hydrostatic pressure on the nucleus, causing the fibers of the annulus to rupture. Nucleus fragments protrude. This, in turn, may cause pressure on the adjacent nerve root with resultant pain. Degeneration of the disc may also be caused by other factors, for example, by accidental injury.

Several methods of treatment already exist. One method, usually referred to as "laminectomy" involves the surgical excision of the symptomatic portion of the herniated disc. This method of treatment has been used for many years, however, typical hospitalization time in nine days. Microsurgery has also been used in the treatment of herniated discs, in a procedure known as "microlumbar discectomy." This microsurgical procedure, although less invasive, nevertheless carries with it many of the complications associated with the older procedure, including injury to the nerve root and dural sac, perineural scar formation, reherniation of the site of the surgery, and instability due to excess bone removal. Another method of treatment is known as chemonucleolysis, which is carried out by injection of the enzyme chymopapain into the disc structure. This procedure has many complications including severe pain and spasm, which may last up to several weeks following injection. Sensitivity reactions and anaphylactic shock occur in limited but significant numbers of patients.

A further method of treatment, automated percutaneous lumbar discectomy, utilizes a specially designed needle which is inserted into a ruptured disc space. The nucleus of the disc is removed by suction instead of open surgery.

Another method of treatment is discussed in U.S. Patent 4,573,448 and involves the percutaneous evacuation of fragments of the herniated disc through an access cannula positioned against the annulus of the herniated disc. A measure of safety and accuracy is added to this operative procedure by the arthroscopic visualization of the annulus and other important structures which lie in the path of the instruments, such as the spinal nerve. While a considerable improvement over the existing procedures, nevertheless, this procedure does not enable the surgeon to directly view the resection of posterior nuclear fragments. That is, the internal diameter of the access cannula as described in U.S. Patent 4,573,448 limits the design of an operating discoscope and limits the type and size of instruments that would allow for the visualization and simultaneous suction, irrigation and resection of the nuclear material.

The introduction of a second portal to the annulus from the opposite side of a first portal has been reported by Schreiber and his co-workers in Clinical Orthopaedics and Related Research, Number 238, page 36, January 1989. However, this bilateral, biportal procedure increases the operating room time, exposure to radiation by physician, patient and operating room personnel and also increases post-operative morbidity by involving both sides of the back and may cause excessive removal of nuclear material which increases the possibility for stenosis of the foramen and nerve root compression.

Thus, there is a need in the art for a percutaneous procedure to create an accessory unilateral portal in the annulus adjacent to an already positioned access cannula with a minimal additional exposure of the

patient, physician and operating room staff to radiation and without unduly prolonging time spent in the operating room. A unilateral, biportal approach will allow for continuous visualization, identification and extraction of nuclear fragments from the disc under discoscopic control. Large central herniations and partially extruded fragments may be visualized and evacuated. Such a unilateral approach to place more than one percutaneous portal in, for example, the L5-S1 vertebral joint, is also highly desirable because this procedure requires deflection of the patient's spine to enable access on the one side, causing a corresponding restriction of access on the opposite side. Moreover, by using a unilateral biportal approach, instruments do not need to traverse across the disc nucleus from a second portal remote from the symptomatic side. Therefore, the amount of non-symptomatic nuclear material removed by the unilateral approach is decreased as compared to the bilateral biportal approach. This is important in preventing collapse of disc approach. This is important in preventing collapse of disc space, which results in nerve compression and stenosis of the spinal canal. Also, another significant benefit of the unilateral approach is that the musculature and soft tissue and disc are traumatized on only one side of the back.

Summary of the Invention

The present invention provides a percutaneous surgical disc procedure, comprising the steps of percutaneously entering the back of the patient in a posterolateral direction with an access cannula, advancing said access cannula through a first percutaneously created

fenestration of the annulus of the disc, percutaneously entering the back of the patient in a posterolateral direction with an accessory cannula, and advancing said accessory cannula through a second percutaneously created fenestration of the annulus adjacent to and on the same side of the disc as the first fenestration.

The present invention also provides a method for the percutaneous decompression of a herniated intervertebral disc in a human patient, which comprises percutaneously entering the back of the patient in a posterolateral direction with an access cannula, advancing the access cannula into the disc through a first percutaneously created fenestration of the annulus of the disc, percutaneously entering the back of the patient in a posterolateral direction with an accessory cannula, advancing the accessory cannula into the disc through a second percutaneously created fenestration of the annulus adjacent to and on the same side of the disc as the first fenestration, removing nuclear material through one of the cannulae and observing the removal with an endoscope through the other.

The present invention also provides a guide means or jig for guiding the accessory cannula into the disc in an aligned relationship with the access cannula. In an alternate embodiment of the present invention a single oval cannula replaces the two cannulae through which both the procedure and the viewing can be performed.

In a broader sense, the present invention provides a method of percutaneously emplacing at least two cannulae in a patient, comprising percutaneously entering the back of the patient in a posterolateral

direction with a first cannula and advancing the first cannula into the body of the patient to a position where the distal end of the first cannula is at a first predetermined location inside the body and the proximal end thereof projects beyond the outer surface of the back, securing a guide means to the proximal end of the first cannula and using the guide means to guide a second cannula as it percutaneously enters the back of the patient in a posterolateral direction and is advanced to a second predetermined location relative to said first predetermined location.

The method of the present invention requires only a small incision to place the cannulae, since this biportal approach utilizes unilateral placement. The unilateral biportal approach allows for continuous discoscopic control and visualization and provides adequate channels for fluid management, which significantly enhances the visual identification of the posterior annulus. The method in accordance with the invention may be carried out under local anesthesia, thus avoiding the risk of general anesthetics.

Brief Description of the Drawings

A better understanding of the invention can be obtained when the detailed description of exemplary embodiments set forth below is reviewed in conjunction with the accompanying drawings, in which:

FIGURE 1 is a plan view of a guide wire useful in the present invention;

FIGURE 2 is a plan view, partly in section, of a cannulated obturator useful in the present invention;

FIGURE 3 is a plan view, partly in section, of an access cannula useful in the present invention;

FIGURE 4 is a plan view of a trephine useful in the present invention;

FIGURE 5 is an elevational view of a first jig useful in the present invention;

FIGURE 6 is a view in section, taken along the lines 6-6 in Fig. 5;

FIGURE 7 is an elevational view in section of a sealing adaptor useful in the present invention;

FIGURE 8 is an elevational view of a second jig useful in the present invention;

FIGURE 9 is a view in section, taken along the lines 9-9 in Fig. 8;

FIGURE 10 is a schematic view of a first access cannula inserted into the herniated disc;

FIGURE 11 is a view similar to Fig. 10 showing the use of the second jig to index a second accessory cannulae relative to the first access cannula;

FIGURE 12 is a schematic view showing two cannulae placed in the body of the patient with the sealing adaptor of Fig. 7;

FIGURE 13 is an elevational view of an alternate embodiment of a first jig of the present invention;

FIGURE 14 is a view in section, taken along the lines 14-14 in Fig. 13;

FIGURE 15 is an elevation view of an alternate embodiment of a second jig of the present invention;

FIGURE 16 is a view in section, taken along the line 16-16;

FIGURE 17 is a schematic view of an access cannula and a converging accessory cannula inserted into the disc.

FIGURE 18 is a schematic view of two cannulae inserted into the herniated disc;

FIGURE 19 is a schematic view of an oval cannula inserted over the two cannulae shown in Fig. 18;

FIGURE 20 is a view in section, taken along the lines of 20-20 in Fig. 19;

FIGURE 21 is a schematic view of a procedure being performed through an oval cannula inserted into the herniated disc;

FIGURE 22 is an elevational view of a second alternate embodiment of a jig of the present invention.

Detailed Description of a Preferred Embodiment

In the description that follows, instruments are generally made out of suitable austenitic stainless steel, unless otherwise specified. While the surgical procedure described herein refers to decompression of intervertebral lumbar discs, it is to be understood that the procedure is not limited to lumbar discectomy and may be used in any procedure for percutaneously emplacing at least two cannulae in a patient, such as an intervertebral disc procedure or operation.

According to the method of the present invention, the patient is positioned on a radiolucent table in the appropriate prone or lateral position and a guidewire 10 (Fig. 1), suitably of about 0.050 in.

diameter, is advanced through the skin of the back posterolaterally under fluoroscopic observation until the guidewire 10 contacts the exterior symptomatic side of the annulus fibrosis of the herniated disc. Thereafter, the cannulated obturator 20 (Fig. 2), having a lumen with a diameter slightly larger than that of the guidewire 10, is passed over the guidewire 10 until the cannulated obturator 20 contacts the external surface of the annulus fibrosis of the herniated disc. The removal of the guidewire 10 at this point is optional. An access cannula 30a (Fig. 3), suitably of about 0.25 in. outer diameter and having external gradations 31 of 10 mm, is then passed over the cannulated obturator 20 and advanced to the external surface of the annulus fibrosis. At this point, the guidewire 10 is removed if not previously removed. The inner diameter of the access cannula 30a is sized to closely fit over the cannulated obturator 20. The cannulated obturator 20 is then removed, and a 3 mm or 5 mm trephine 40 (Fig. 4) is introduced through the access cannula 30a. The trephine 40 has a plurality of saw teeth 40a or other cutting members. The trephine 40 is advanced into the annulus of the disc, with rotation, creating an annular fenestration (that is, a bore) through the annulus fibrosis into the nucleus. The trephine 40 is then removed.

The cannulated obturator 20 is reintroduced into the access cannula 30a and passed into the fenestration of the annulus. Fluoroscopic guidance may be utilized. The access cannula 30a is then advanced into the fenestration of the annulus, with rotary movement. After the access cannula 30a is in the proper position, the cannulated

obturator 20 is removed. The proximal end of cannula 30a projects beyond the surface of the patient's back (not shown) while the distal end is in the position shown in Fig. 10. The procedure described for placement of cannula 30a into the annulus of the disc follows the procedure described in U.S. Patent 4,573,448. As is known, suitable local anesthetic is used as appropriate.

Referring to Fig. 10, the procedure described above locates the distal end of the access cannula 30a adjacent the herniation 100 of the disc 101, which protrudes toward the posterior ligament 102 thus placing pressure on the nerves 103, which causes the pain characteristic of a herniated lumbar disc. First jig 50 (Figs. 5, 6 and 10) is slid downwardly over the proximal end of the access cannula 30a by passing the access cannula 30a through the central bore 51 in the first jig 50. Jig 50 is secured in place near the proximal end of cannula 30a by tightening the screw 53 thereby clamping the legs 52a and 52b to the access cannula 30a.

First jig 50 preferably has a plurality of smaller bores 55 each having a diameter substantially the same as the diameter of the guidewire 10. The axes of the bores 55 are spaced from and are preferably parallel to the axis of the large bore 51. Alternatively, jig 50 may have only one smaller bore 55. Moreover, the bores 55 may be oblique to the axis of the large bore 51.

Under fluoroscopic observation, the guidewire 10 is slid through a selected one of the small bores 55 so that the guidewire 10 will ideally be centered on the annulus fibrosis. If necessary, a second guidewire 10

is passed through another of bores 55 and advanced toward the annulus fibrosis of the disc, while under fluoroscopic observation. Proper positioning of the guidewire on the annulus is determined by palpation and, if necessary, by fluoroscopy. The surgeon can then evaluate the placement of the guidewires and select the guidewire best positioned to provide the second fenestration of the annulus of the disc.

Having selected the desired guidewire 10, the other guidewire, if any, is removed, and the guidewire 10 is then introduced through the fibers of the annulus fibrosis for a distance of about three to about four millimeters. Jig 50 is removed, leaving the guidewire 10 and access cannula 30a in place.

Second jig 70 (Figs. 8, 9 and 11) is secured to access cannula 30a near the proximal end by passing access cannula 30a through bore 70a, passing the guidewire 10 through bore 70b, and clamping legs 70c together by means of screw 70d. Cannulated obturator 20 is then advanced over the guidewire 10 by rotary movement through the bore 70b of the second jig 70 until the cannulated obturator 20 contacts the annulus fibrosis, as shown in Fig. 11. The guidewire 10 and jig 70 are removed leaving the cannulated obturator 20 in place. An accessory cannula 30b is passed over the cannulated obturator 20 and advanced toward the annulus fibrosis. Accessory cannula 30b is sized to slide in the annulus between bore 70b and the outer surface of cannulated obturator 20. The cannulated obturator 20 is then removed, leaving the accessory cannula 30b in place. While it is presently preferred that cannulae 30a, 30b have the same inner and outer diameters, one may

have a smaller inner and/or outer diameter than the other. Although it is presently preferred to use the second jig 70, it is not necessary to do so.

In certain circumstances it may be desirable to insert the accessory cannula 30b at an angle relative to the access cannula 30a so that the cannulae 30a and 30b converge at or near their tips (Fig. 17). In this situation a jig is used which has one or more of the bores positioned oblique to the center bore rather than parallel to it. A jig 80 (Figs. 13 and 14) is provided which is identical in structure to jig 50 except for the axis of the smaller bores 55. In jig 80 a plurality of smaller bores 85 have an axis that is at an angle relative to the longitudinal axis of a large bore 81. The angle of the axis of the smaller bores 85 can be between about 10 to 50° and is preferably 30° relative to the longitudinal axis of the large bore 81 as shown in Fig. 14. The converging cannulas can be most useful in extra discal surgery and for foraminal surgery or surgery inside of the spinal canal for direct visualization and retrieval of sequestrated fragments.

A jig 90 (Figs. 15 and 16) is also provided which is identical in structure to jig 70 except for the axis of the bore 70b. In jig 90 a bore 90b has an axis that is at an angle relative to the longitudinal axis of a central bore 90a. The angle of the axis of the bore 90b can be between about 10 to 50° and is preferably 30° relative to the longitudinal axis of the central bore 91 as shown in Fig. 16. Both of the jigs 80 and 90 are used in the method of the present invention in the same manner as jigs 50 and 70 are used.

The annulus fibrosis is inspected endoscopically through the accessory cannula 30b, and if satisfactory, a trephine 40 is passed through the accessory cannula 30b and a second fenestration is cut through the annulus fibrosis into the nucleus. The trephine 40 is then removed. The accessory cannula 30b is advanced into the annulus. Introduction of both cannulae into the annulus of the disc under fluoroscopic observation is carried out in a manner known per se, such as described in U.S. Patent 4,573,448.

Fragments of the herniated disc can be removed through the desired cannula 30a and 30b by inserting a trephine 40 in the desired cannula and moving it back and forth within the nucleus of the herniated disc as suction is applied. Alternatively, the trephine can be removed and suction may be applied through the cannula itself. In another method, forceps, trimmer blades, suction punch forceps laser lights, etc. are used to remove such fragments via one of the cannula.

Preferably, however, before removal of nuclear material, a sealing adaptor 60 (Fig. 7), which is suitably comprised of silicon rubber, is attached to the proximal extremity of the access cannula 30a and accessory cannula 30b, as shown in Fig. 12 with access cannula 30a and accessory cannula 30b received in bores 61a and 61b of sealing adaptor 60. Insertion of access cannula 30a and accessory cannula 30b into the sealing adaptor will stop when the cannulae contact shoulders 63 and 64, respectively of bores 61a and 61b. Nuclear evacuation through one of the cannulae 30a or 30b and simultaneous arthroscopic observation via the other of cannulae 30a or 30b is possible by sealingly

passing an arthroscope (not shown) into one of bores 62a and 62b and thence into one of cannula 30a or 30b, while a tool (not shown) is inserted into the other bore and thence into the other cannula. Nuclear material may then be evacuated by a conventional powered surgical instrument (not shown) through the access cannula 30a or accessory cannula 30b while under arthroscopic observation through the other cannula. A saline solution may be passed via the arthroscope through one cannula and excess fluid may be evacuated through the other cannula. Direct visualization of the resection of the desired disc material is thus made possible.

In an alternate embodiment of the present invention the surgical procedure and viewing can be done through a single oval cannula rather than the cannulae 30a and 30b. If this alternate method is used two cannulated obturators 20 or cannulas 30a, 30b are inserted into the disc 101 in the manner described above using the jig 70 to align the obturators 20 or cannulae 30a, 30b in parallel alignment as shown in Fig. 18. The jig 70 is removed and an oval cannula 110, slightly larger in diameter than the two obturators 20a, 20b or cannulae 30a, 30b, is slid downwardly over the obturators 20a, 20b or cannulae 30a, 30b and inserted into the annulus fibrosis (Figs. 19 and 20). The obturators 20a, 20b or cannulae 30a, 30b are removed and the surgical procedure and viewing are performed through the single oval cannulae 110 (Fig. 21). The oval cannula 110 has a uniform inner and outer diameter and a transverse cross section that is defined by an X axis D1 and a Y axis D2 (Fig. 20). The Y axis D2 has a dimension generally between about 3 to

11 millimeters and the X axis D1 has a dimension of generally between about 5 to 22 millimeters and a longitudinal length of generally between about 50 to 250 millimeters. These dimensions will accommodate the variety of obturators 20 and cannulae 30 used in the method of the invention.

If the surgical procedure is performed on a patient having a small disc space, a half circle cannula of a type known in the industry can be used with an alternate jig 120 having a central bore 121 and a second bore 122 in the shape of a half circle as shown in Fig. 22. An oval cannula 110 with a smaller diameter can then be slid over the cannulae to provide a working channel which will fit into the smaller disc space.

It should be understood that there can be improvements and modifications made to the embodiments of the invention described in detail above without departing from the spirit or scope of the invention, as set forth in the accompanying claims.

CLAIMS

What is claimed is:

1. An apparatus for use in a percutaneous surgical disc procedure, comprising:

a) means for percutaneously entering the back of the patient in a posterolateral direction to form and enlarge a fenestration in the annulus of the disc, said means including guidewires and access cannulae;

b) a jig including a primary bore having a longitudinal axis and means for removably attaching the jig to the access cannula;

c) at least one small bore placed through the jig for slidingly receiving guidewires, the small bore being placed with an axis generally angled relative to the longitudinal axis of the primary bore when the jig is attached to the access cannula;

d) the attaching means including a clamp for engaging the access cannula at the primary bore.

2. The jig of claim 1, wherein the attaching means further includes spaced apart legs straddling the primary bore and terminating in free ends with an open slot extending between the legs from the free end to the primary bore, and means for moving the legs together for engaging the access cannula at the primary bore.

3. The jig of claim 2, wherein the moving means includes a screw.

4. The jig of claim 1, wherein the angle of the axis of the small bore is between about 10 to 50° relative to the longitudinal axis of the primary bore.

5. An apparatus for use in a percutaneous surgical disc procedure, comprising:

a) means for percutaneously entering the back of the patient in a posterolateral direction to form and enlarge a fenestration in the annulus of the disc, said means including guidewires and access cannulae;

b) a jig including a primary bore having a longitudinal axis and means for removably attaching the jig to the access cannula;

c) a plurality of small bores placed through the jig for slidingly receiving guidewires, the small bores being placed with their axes parallel to one another, and when the jig is attached to the access cannula the small bores are spaced from and are generally angled relative to the longitudinal axis of the primary bore;

d) the attaching means including spaced apart legs straddling the primary bore and terminating in free ends with an open slot extending between the legs from the free end to the primary bore, and means for moving the legs together for engaging the access cannula at the primary bore.

6. The jig of claim 5, wherein the moving means includes a screw.

7. The jig of claim 5, wherein the angle of the axes of the small bores is between about 10 to 50° relative to the longitudinal axis of the primary bore.

8. An apparatus for use in a percutaneous surgical disc procedure using an access cannula to percutaneous advance into a disc space, comprising:

a) means for percutaneously entering the back of the patient in a posterolateral direction to form and enlarge a fenestration in the annulus of the disc, said means including guidewires and access and accessory cannulae;

b) a jig including a primary bore having a longitudinal axis and means for removably attaching the jig to the access cannula;

c) an auxiliary bore placed through the jig for guiding an accessory cannula as it is percutaneously advanced into a disc space, the bore being placed with an axis generally angled relative to the longitudinal axis of the primary bore when the jig is attached to the access cannula;

d) the attaching means including a clamp for engaging the access cannula at the primary bore.

9. The jig of claim 8, wherein the attaching means further includes spaced apart legs straddling the primary bore and terminating in free ends with an open slot extending between the legs from the free end to the primary bore, and means for moving the legs together for engaging the access cannula at the primary bore.

10. The jig of claim 9, wherein the moving means includes a screw.

11. The jig of claim 8, wherein the angle of the axis of the auxiliary bore is between about 10 to 50° relative to the longitudinal axis of the primary bore.

12. An apparatus for use in a percutaneous surgical disc procedure using an access cannula to percutaneous advance into a disc space, comprising:

a) means for percutaneously entering the back of the patient in a posterolateral direction to form and enlarge a fenestration in the annulus of the disc, said means including guidewires and access and accessory cannulae;

b) a jig including a primary bore having a longitudinal axis and means for removably attaching the jig to the access cannula;

c) an auxiliary bore placed through the jig for guiding an accessory cannula as it is percutaneously advanced into a disc space, the bore being placed with an axis generally angled relative to the

longitudinal axis of the primary bore when the jig is attached to the access cannula;

d) the attaching means including spaced apart legs straddling the primary bore and terminating in free ends with an open slot extending between the legs from the free end to the primary bore, and means for moving the legs together for engaging the access cannula at the primary bore.

13. The jig of claim 12, wherein the moving means includes a screw.

14. The jig of claim 12, wherein the angle of the axis of the auxiliary bore is between about 10 to 50° relative to the longitudinal axis of the primary bore.

15. An apparatus for use in a percutaneous surgical disc procedure, comprising:

a) means for percutaneously entering the back of the patient in a posterolateral direction to form and enlarge a fenestration in the annulus of the disc, said means including guidewires and access and accessory cannulae;

b) a jig including a primary bore having a longitudinal axis and means for removably attaching the jig to the access cannula;

c) a half circle shaped auxiliary bore placed through the jig for guiding a similarly shaped accessory cannula as it is

percutaneously advanced into a disc space, the bore being placed with an axis generally parallel to the longitudinal axis of the primary bore when the jig is attached to the access cannula;

d) the attaching means including spaced apart legs straddling the primary bore and terminating in free ends with an open slot extending between the legs from the free end to the primary bore, and means for moving the legs together for engaging the access cannula at the primary bore.

16. The jig of claim 15, wherein the moving means includes a screw.

17. A cannula system for use in a percutaneous surgical disc procedure, comprising:

a) a first cylindrical elongated tube having a uniform inner and outer diameter capable of being percutaneously inserted into the back of the patient;

b) a second cylindrical elongated tube having a uniform inner and outer diameter capable of being percutaneously inserted into the back of the patient;

c) an elongated outer tube having a uniform inner and outer diameter and a transverse cross section that is defined by an X axis and a Y axis, wherein the X axis dimension is greater that the Y axis dimension so that the first and second tubes can fit inside the outer tube;

d) the outer tube being capable of sliding over the first and second tubes when inserted into the back of the patient in close parallel alignment;

e) wherein the first and second tubes are removable so that surgical instruments and viewing means can be introduced into the outer tube in order to perform surgical procedures on the patient's tissue.

18. The cannula of claim 17, wherein the outer tube is generally in the shape of an oval.

19. The cannula of claim 17, wherein the outer tube generally has a Y axis dimension of between about 3 to 11 millimeters and an X axis dimension of between about 5 to 22 millimeters and a length of between about 50 to 250 millimeters.

20. The cannula system of claim 17, wherein the means for close parallel alignment includes a jig having a primary bore and an auxiliary bore and means for removably attaching to the first tube.

21. A percutaneous surgical disc procedure, comprising the steps of:

a) percutaneously entering the back of the patient in a posterolateral direction with an access cannula;

b) advancing the access cannula through a first percutaneously created fenestration of the annulus of the disc;

c) securing a guide to the access cannula;

d) percutaneously entering the back of the patient in a posterolateral direction with an accessory cannula;

e) using a guide to advance the accessory cannula into a second percutaneously created fenestration of the annulus adjacent to and on the same side of the disc as the first fenestration for orienting the access cannula and the accessory cannula relative to each other on the same side of the disc;

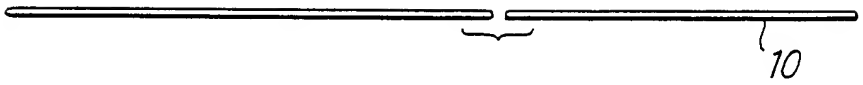
f) removing the guide from the access and accessory cannulae;

g) sliding an oval cannula downwardly over the access and the accessory cannulae and inserting the oval cannula into the disc;

h) removing the access and accessory cannulae from the disc; and

i) introducing surgical instruments and viewing means into the oval cannula to perform the surgical procedure.

FIG. 1



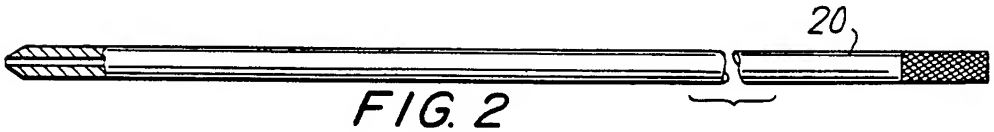


FIG. 2

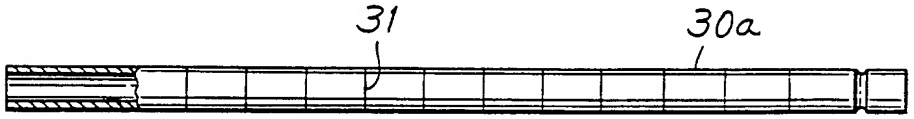


FIG. 3

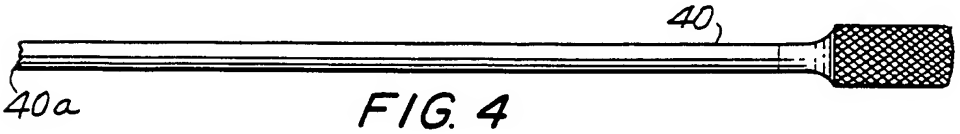
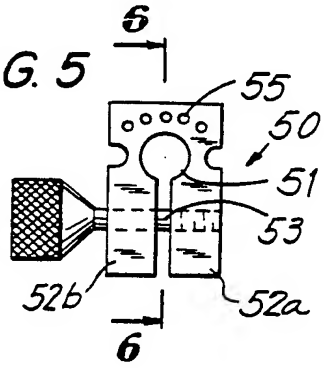


FIG. 4

FIG. 5



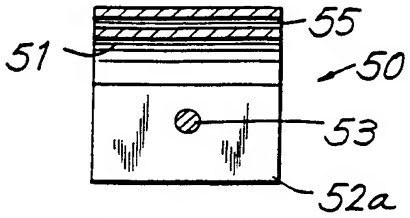


FIG. 6

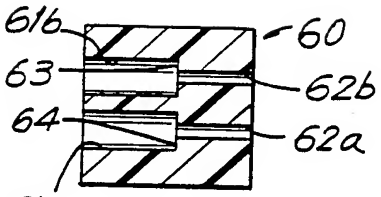


FIG. 7

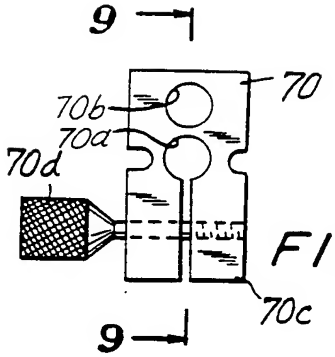


FIG. 8

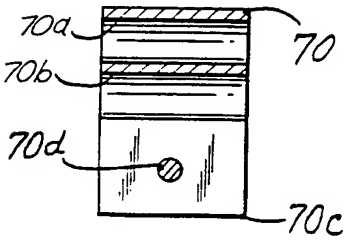


FIG. 9

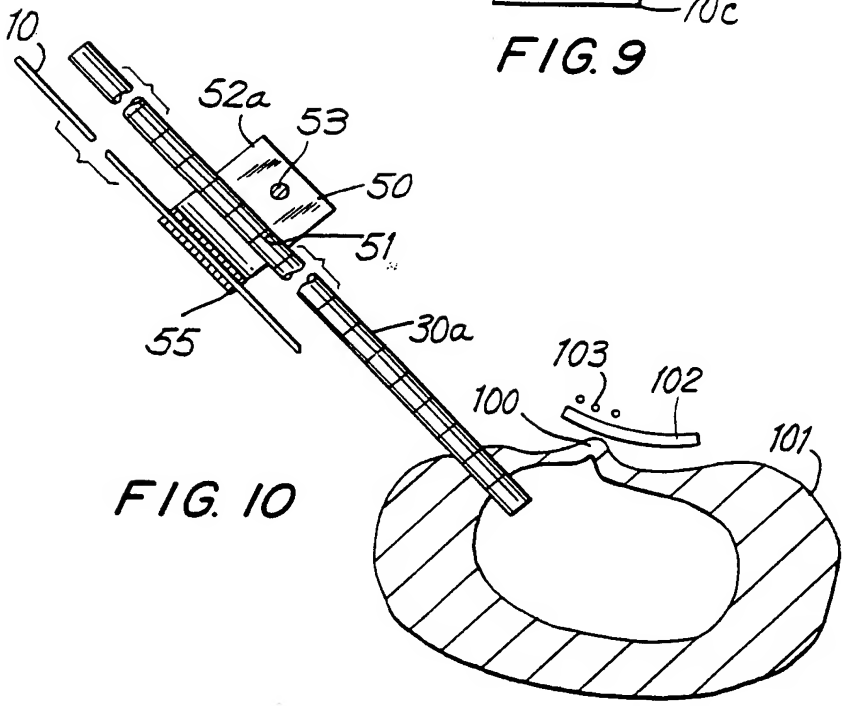


FIG. 10

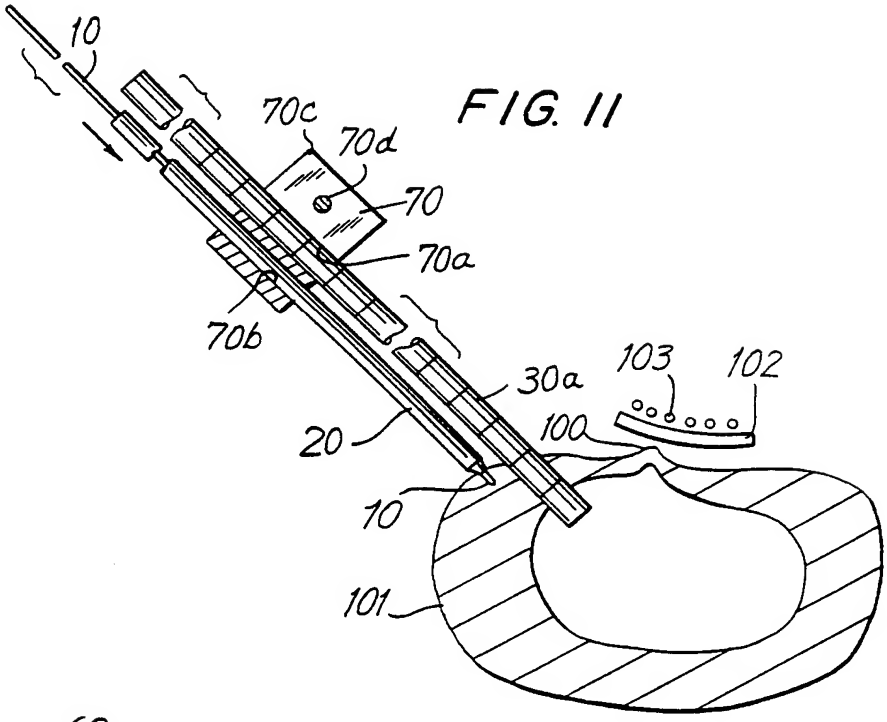

10
70c
70d
70
70a
70b
30a
103
102
100
20
10
101

FIG. 11

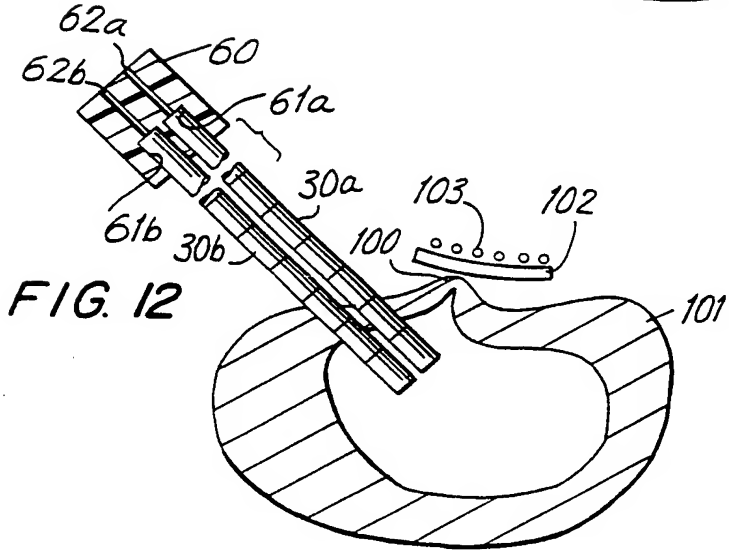

62a
60
62b
61a
30a
103
102
61b
30b
100
101

FIG. 12

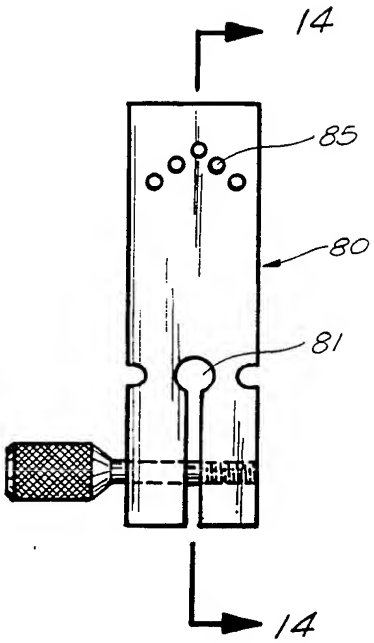


FIG. 13

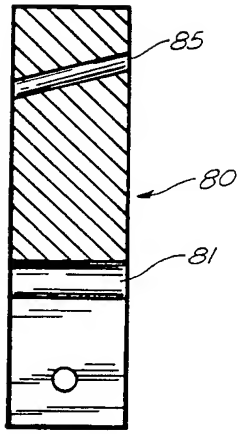


FIG. 14

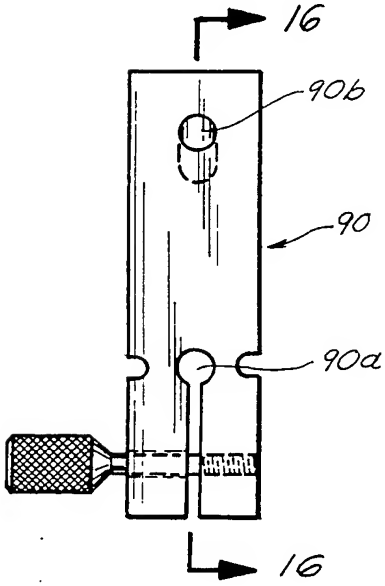


FIG. 15

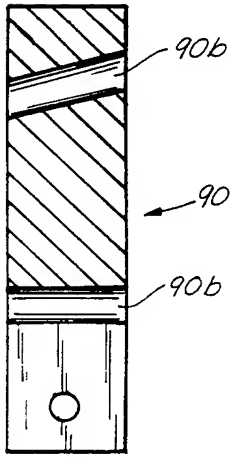


FIG. 16

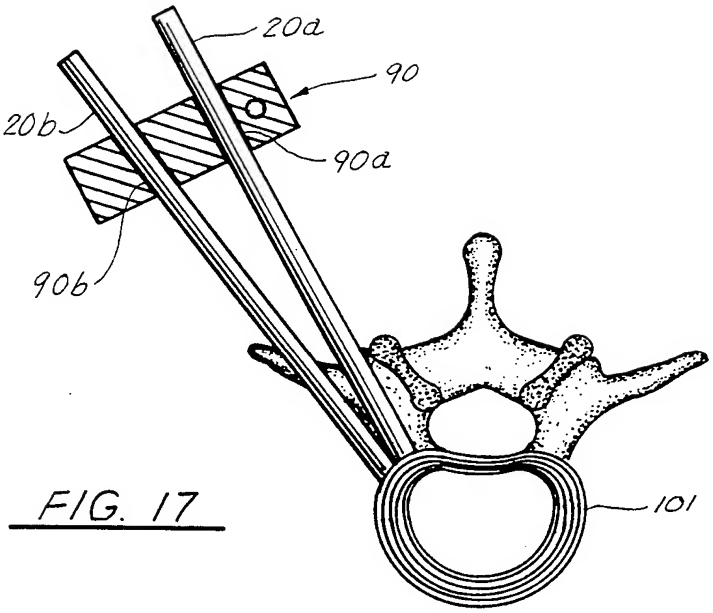


FIG. 17

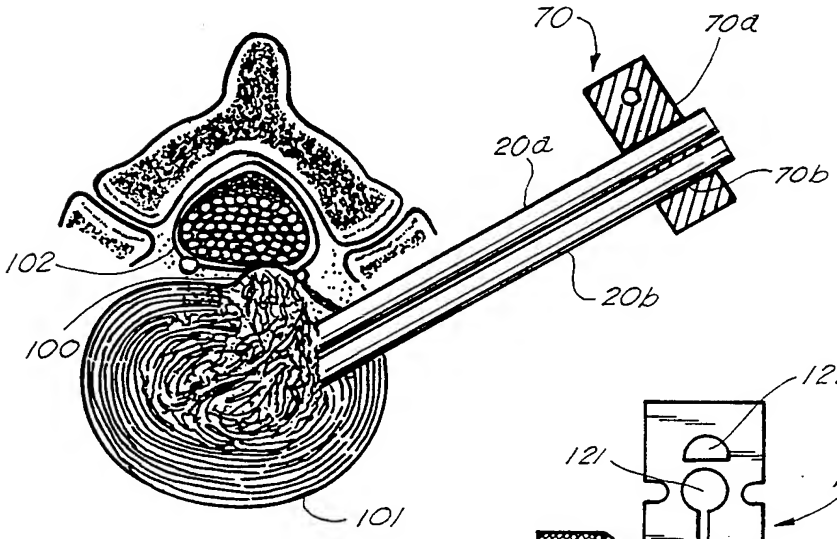


FIG 18

FIG. 22

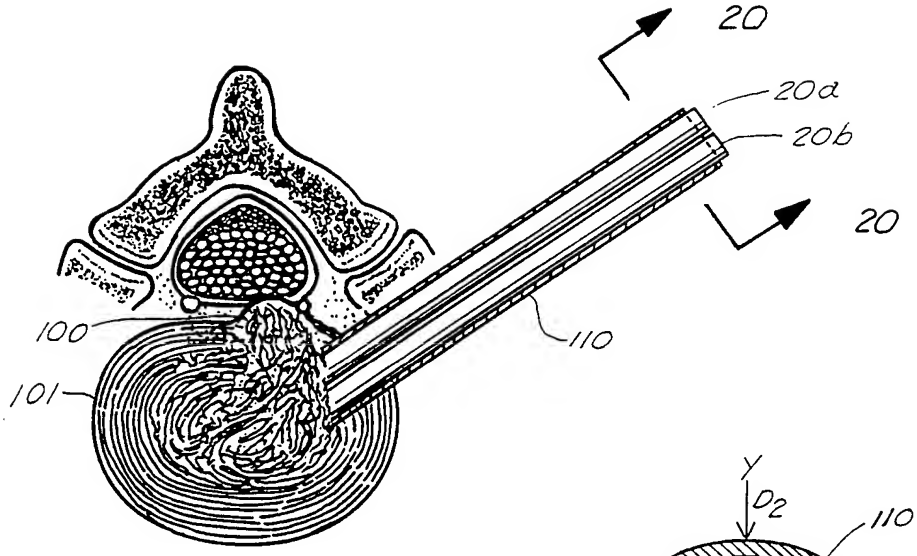


FIG. 19

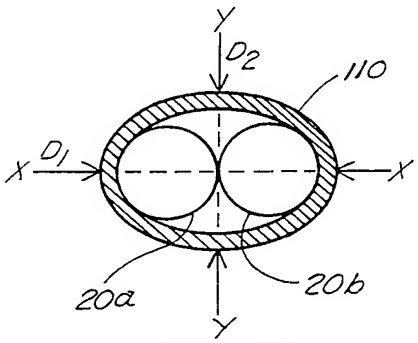


FIG. 20

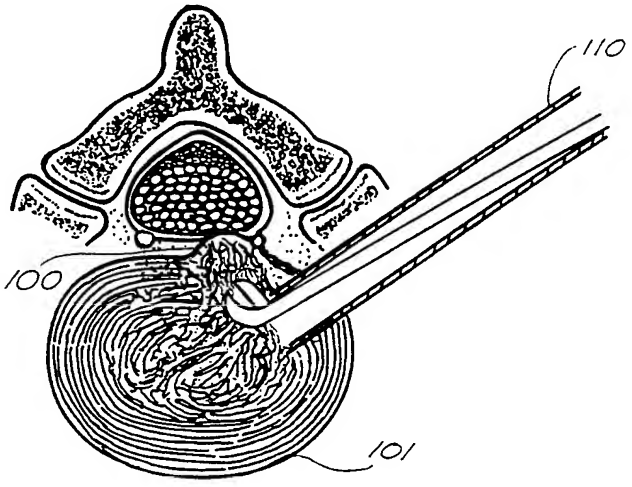


FIG. 21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US95/02105

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A61B 10/00; A61M 5/00, 31/00
US CL :604/51; 606/61, 130
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 128/DIG. 26, 898; 604/22, 51, 116, 117, 170, 174; 606/61, 130

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4,539,976 (SHARPE) 10 September 1985. See entire document.	1-20
A	US, A, 3,941,127 (FRONING) 02 March 1976. See entire document.	1-21
A	US, A, 4,545,374 (JACOBSON) 08 October 1985. See entire document.	1-21
A	US, A, 4,573,448 (KAMBIN) 04 March 1986. See entire document.	1-21
A, P	US, A, 5,312,391 (WILK) 17 May 1994. See Figs. 1-5.	17-20

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be part of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)		
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

Date of the actual completion of the international search
24 APRIL 1995

Date of mailing of the international search report
01 JUN 1995

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Form PCT/ISA/210 (second sheet)(July 1992)*